

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of Eiju SUZUKI et al.

Application No.: 10/564,727

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For: PNEUMATIC TIRE

Group Art Unit: 1796

Examiner: Fred M. Teskin

Confirmation No.: 9652

DECLARATION UNDER 37 C.F.R. § 1.132

I, Junko Matsushita, declare that:

I am a co-worker of Mr. Eiju Suzuki and Mr. Yoichi Ozawa who are one of the inventors of the above-captioned patent application.

I received my Master of Science in Chemistry Degree from Rikkyo University in 2003, and I have been employed by Bridgestone Corporation since 2003, where I have been engaged mainly in research and development of materials for tires, especially a rubber produced through a polymerization using a rare earth metal-based catalyst.

I have made the following experiments under the supervision of Mr. Yoichi Ozawa in order to evaluate an effect on inhibiting extension crystallinity due to a vinyl bond and a trans-1,4 bond existing in a polybutadiene.

Experimental Procedure

There are prepared four polybutadienes having the following cis-1,4 bond content, vinyl bond content and trans-1,4 bond content as measured by a Fourier transform infrared spectroscopy (FT-IR).

	cis-1,4 bond (%)	vinyl bond (%)	trans-1,4 bond (%)
Polybutadiene 1	98.87	0.36	0.77
Polybutadiene 2	98.89	0.13	0.98
Polybutadiene 3	98.17	0.48	1.35
Polybutadiene 4	98.11	0.36	1.53

Then, a rubber composition comprising the above-described polybutadiene is prepared according to the following recipe:

	Component	parts by mass
1st stage	Polybutadiene *1	50
	Natural Rubber	50
	Carbon black	50
	Stearic acid	2
	Antioxidant 6C *2	3.5
Final stage	Zinc oxide	3
	Antioxidant 224 *3	1
	Vulcanization accelerator CZ-G *4	0.4
	Vulcanization accelerator DM-P *5	0.2
	Sulfur	1.4

- \*1 The above-described polybutadiene
- \*2 N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine
- \*3 Polymerized 2,2,4-trimethyl-1,2-dihydroquinoline
- \*4 N-cyclohexyl-2-benzothiazole sulfenamide
- \*5 Dibenzothiazyl disulfide

Next, a tire having a tire size of 175/70R13 is prepared by applying each of the rubber compositions to a sidewall. A cut having a width of 2 mm and a depth of 2.0 mm is formed in a position corresponding to a maximum width of the tire at an angle of 45 degrees with respect to a sectional direction of the tire through a knife. The tire is then assembled onto a rim of 5J and run over 10,000 km by a drum test under conditions that the internal pressure is 1.9 kg/cm<sup>2</sup>, the load is 405 kg and the speed is 50 km/h to measure a length of the cut grown and show the resulting length by an index. The larger the index value, the shorter the length of the cut grown and the better the resistance to crack growth. The results are shown below.

		cis (%)	vinyl (%)	trans (%)	Resistance to crack growth (Index)
Comparison 1	Polybutadiene 1	98.87	0.36	0.77	100
	Polybutadiene 2	98.89	0.13	0.98	106
	difference	0.02	-0.23	0.21	6
Comparison 2	Polybutadiene 3	98.17	0.48	1.35	100
	Polybutadiene 4	98.11	0.36	1.53	103
	difference	-0.06	-0.12	0.18	3

(Summary)

According to a mechanism, it is expected that a polybutadiene with a cis-1,4 bond content of 100% have the highest extension crystallinity.

In Comparison 1, the decrement of the vinyl bond content is 0.23 and the effect on improving the resistance to crack growth is 6 as the index. In Comparison 2, the decrement of the vinyl bond content is 0.12 and the effect on improving the resistance to crack growth is 3 as the index. These results show that the extension crystallinity becomes better as the decrement of the vinyl bond content is larger.

On the other hand, the increment in the trans-1,4 bond content in Comparison 1 is larger than that in Comparison 2, but the effect on improving the resistance to crack growth in Comparison 1 is larger than that in Comparison 2. These results show that the trans-1,4 bond content has a small adverse effect on the extension crystallinity as compared with the vinyl bond.

As seen from these results, it is confirmed that the vinyl bond has a more effect on inhibiting extension crystallinity as compared with the trans-1,4 bond.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 23. May. 2008

Declarant: Junko Matsushita  
Junko Matsushita